

Environmental Communication in Marine Conservation: Reframing *Kaombo* as a Culturally Embedded System in Coastal Indonesia

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ABSTRACT:

This study explores the role of environmental communication in marine conservation through the local wisdom of Kaombo in Wasuemba Village, Buton, Indonesia. Despite growing recognition of community-based conservation, the influence of culturally embedded communication systems on ecological behavior remains underexplored. Using a qualitative case study approach, data were collected through in-depth interviews, participant observation, focus group discussions, and document analysis involving 11 key informants selected via snowball sampling. The findings demonstrate that Kaombo functions not only as a traditional regulatory mechanism but also as an environmental communication system, where conservation values are transmitted through symbolic narratives, customary authority, and social practices. The Parabela plays a crucial role in legitimizing and disseminating environmental messages, while community compliance is driven by moral and social norms rather than formal enforcement. However, challenges in intergenerational knowledge transmission persist amid socio-cultural change. This study reconceptualizes Kaombo as an integrated environmental communication system and proposes the concept of moral-ecological governance. The findings underscore the importance of incorporating cultural values and local communication practices into sustainable marine conservation strategies.

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1. Introduction

Marine conservation has become an increasingly urgent global priority, particularly in coastal and small island regions that heavily depend on marine resources for their livelihoods. Indonesia, as the

world's largest archipelagic country, possesses extraordinary marine biodiversity; however, it simultaneously faces significant ecological pressures due to overexploitation, pollution, and climate

change. This condition underscores the importance of conservation strategies that are not solely ecologically oriented but also integrated with the social and cultural contexts of local communities (Liu et al., 2023; UNEP, 2019).

In recent years, studies in ethnobiology and environmental governance have emphasized the importance of integrating local knowledge systems into conservation practices. Local wisdom, rooted in long-standing interactions between communities and their environments, has proven effective in regulating resource use sustainably and maintaining ecological balance (Berkes, 2018; Raymond et al., 2010). In Indonesia, such systems are often recognized as adaptive, community-based mechanisms that align conservation objectives with socio-cultural values (Fikri & Salim, 2022).

One notable example is *Kaombo*, a customary marine resource management system practiced in Wasuemba Village, Buton Regency. *Kaombo* functions as a traditional regulatory framework that governs access to and utilization of marine resources through spatial and temporal restrictions, as well as social sanctions. Beyond its regulatory role, *Kaombo* embodies moral and spiritual values that reinforce community compliance and collective responsibility toward marine ecosystems (Husain et al., 2024; Syahartijan et al., 2019). Previous studies suggest that such customary institutions are often more effective than top-down conservation policies, particularly when supported by strong community participation and cultural legitimacy (Halliday et al., 2018).

However, the sustainability of *Kaombo* faces significant challenges due to socio-economic transformations driven by globalization and modernization. Expanding market access, technological development, and shifting livelihood patterns have intensified the exploitation of marine resources and contributed to the erosion of traditional values. This situation creates tension between short-term economic interests and long-term environmental sustainability (Geiger et al., 2019; Pomeroy et al., 2018). Consequently, local wisdom systems are at risk of marginalization or

declining relevance, particularly among younger generations.

In this context, environmental communication plays a strategic role in bridging traditional knowledge with contemporary environmental challenges. Environmental communication encompasses the processes through which environmental values, knowledge, and practices are conveyed, negotiated, and internalized within communities (Moser, 2010). In culturally rooted communities, communication occurs not only through formal channels but also through rituals, symbols, and customary institutions that shape collective environmental behavior (Sowards et al., 2017).

Previous research indicates that conservation messages are more effective when they are communicated in ways that align with local cultural contexts and value systems (Keane et al., 2020). However, the integration of traditional communication mechanisms with modern communication media remains limited, particularly in rural and remote areas with restricted access to digital technologies (Ban et al., 2019). This highlights the need to examine how environmental communication strategies can be adapted to local socio-cultural contexts while remaining responsive to ongoing social transformations.

Despite the growing body of literature on local wisdom in environmental conservation, studies specifically examining the relationship between environmental communication and the *Kaombo* system remain limited. In particular, there is a lack of research exploring how conservation messages are constructed, transmitted, and internalized within the socio-cultural framework of Wasuemba Village. Furthermore, the role of local leadership, such as the Parabela, in shaping environmental communication and community participation has not been sufficiently examined.

This study aims to address these gaps by analyzing how environmental communication is formulated and practiced within the *Kaombo* system in Wasuemba Village. It also examines how traditional values are maintained, adapted, or transformed in

response to socio-economic changes. By doing so, this research seeks to contribute to the development of more contextual and sustainable culture-based conservation strategies.

Ultimately, this study argues that effective marine conservation requires not only ecological interventions but also communication strategies that are rooted in local culture and capable of empowering communities. The case of *Kaombo* offers an important perspective for understanding the interplay between culture, communication, and conservation, particularly in coastal communities undergoing rapid social change.

2. Methodology

Study Area

This study was conducted in Wasuemba Village, Wabula District, Buton Regency, Indonesia. The site was purposively selected as it represents a community that continues to maintain the *Kaombo* system as a customary marine resource management practice. In addition, the village is characterized by strong socio-cultural structures and a high dependence on marine resources for local livelihoods, making it a relevant setting for examining the relationship between environmental communication and marine conservation.

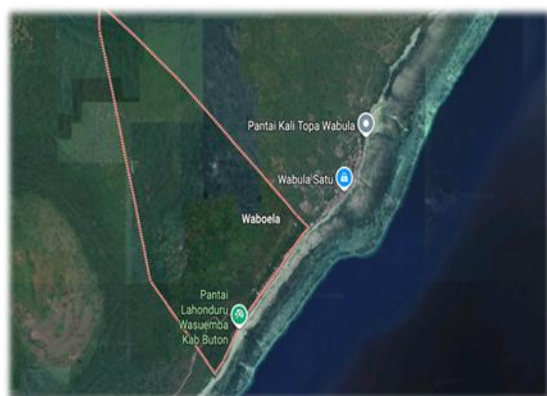


Figure 1. Shows the geographical location of Wasuemba Village in Buton Regency, Southeast Sulawesi, Indonesia, highlighting its coastal setting and proximity to marine ecosystems central to the implementation of the *Kaombo* system.

Research Design

This study employed a qualitative approach using a case study design. This approach was chosen to gain an in-depth understanding of environmental communication practices in marine conservation based on the local wisdom of *Kaombo* within the socio-cultural context of the community. A case study design allows for the exploration of complex phenomena in a contextual and holistic manner, particularly in communities characterized by strong value systems and customary institutions (Yin, 2018; Creswell, 2016).

Data Collection

This study adopted a qualitative approach to gain an in-depth understanding of environmental communication practices in marine conservation based on the local wisdom of *Kaombo* in Wasuemba Village, Buton Regency. Data were collected through in-depth interviews, participant observation, focus group discussions (FGDs), and document analysis.

In-depth interviews were conducted face-to-face with key informants selected using a snowball sampling technique. The process began with traditional leaders, particularly the Parabela, and expanded to other community members who possessed relevant knowledge of the *Kaombo* system. A total of 11 informants were recruited, which was considered sufficient to reach data saturation, as no new information emerged and responses became repetitive.

Participant observation was carried out through the researcher's direct involvement in the daily life of the community, including participation in routine activities and customary rituals related to the implementation of *Kaombo*. This approach enabled a contextual understanding of social interactions, symbolic meanings, and communication practices embedded within the community.

In addition, FGDs were conducted to enrich the data by facilitating collective discussions involving various community members, allowing for the exploration of shared perspectives on marine conservation. The data were further supported by document analysis, including village records,

customary documentation, and visual materials collected during fieldwork.

The research was conducted over an extended period from November 2024 to August 2025, with intensive field engagement to ensure data depth and sustained interaction within the socio-cultural context of the community.

Data Analysis

Data analysis was conducted using a qualitative descriptive approach following the interactive analysis model proposed by Miles and Huberman. The analytical process was carried out concurrently with data collection and continued throughout the entire research process. This iterative approach enabled continuous refinement and validation of the findings.

The analysis consisted of three main stages: data reduction, data display, and conclusion drawing. Data reduction involved selecting, simplifying, and focusing on information relevant to the research objectives, particularly related to environmental communication patterns, the role of local actors, and *Kaombo*-based marine conservation practices.

Subsequently, the data were organized and presented in the form of systematic descriptive narratives to facilitate the identification of patterns, relationships, and emerging themes. The final stage involved drawing and verifying conclusions, which was conducted continuously and iteratively to ensure the consistency and credibility of the findings throughout the research process.

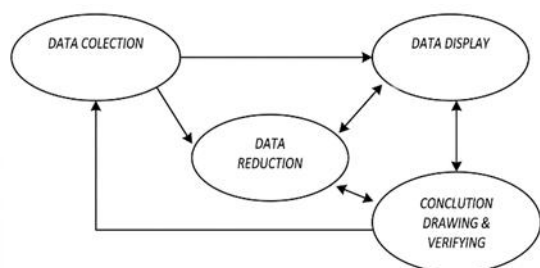


Figure 2. Involving data reduction, data display, and iterative conclusion drawing.

Validity and Trustworthiness

To ensure the credibility and trustworthiness of the data, this study employed triangulation techniques, including both source triangulation and method triangulation. Source triangulation was conducted by comparing information obtained from multiple informants, such as traditional leaders, fishers, and village officials. Meanwhile, method triangulation was applied by integrating data collected through interviews, participant observation, focus group discussions, and document analysis.

This approach enabled the researcher to verify the consistency of the data and enhance the overall credibility of the findings. In addition, data collection and analysis were conducted continuously until data saturation was achieved, ensuring that the findings were robust and well-substantiated.

Ethical Considerations

This study was conducted in accordance with established research ethics, particularly within the context of customary-based communities. The researcher adopted a gradual and respectful approach to engage with the community, aiming to build trust and gain access to culturally sensitive information. Throughout the research process, careful attention was given to respecting local norms, values, and customary practices, including participation in community rituals and social activities.

Participation of informants was based on informed consent, and their identities were kept confidential to ensure privacy and protection. The researcher's involvement in the social life of the community was carried out ethically, without disrupting existing social structures or daily activities, thereby maintaining both the integrity of the research and a respectful relationship with the local community.

3. Results

Kaombo as a Socially Embedded Environmental Regulation System

The findings indicate that *Kaombo* functions as a socially embedded environmental regulation system within the community life of Wasuemba Village. Of

the 11 informants interviewed, 9 emphasized that *Kaombo* is not merely a customary rule, but an integral part of the social fabric that governs community behavior in utilizing marine resources.

The system regulates both the timing and spatial access to marine resource extraction and is reinforced by social norms and spiritual values transmitted across generations. As expressed by one informant:

“Kaombo is not just a prohibition; it is part of our way of life. Violating it means not only breaking a rule but also going against our customs and ancestral beliefs.”

Another informant further emphasized:

“We comply because this has been practiced for generations—not merely out of fear of sanctions, but because it is considered the right thing according to our customs.”

These findings suggest that the social legitimacy of *Kaombo* is constructed through the internalization of cultural values, whereby community compliance is driven more by collective awareness than by external enforcement. This aligns with the argument of Berkes (2018), who highlights the importance of cultural legitimacy in enhancing the effectiveness of community-based resource management systems.



Figure 3. Illustrates the spatial zoning of the Kaombo system, including core protected areas and buffer zones, which regulate access and resource use within the marine environment.

Environmental Communication through Cultural Narratives and Traditional Authority

Environmental communication within the *Kaombo* system is conveyed through cultural narratives and the traditional authority embodied by the Parabela.

Of the 11 informants, 10 identified the Parabela as the primary source of information and legitimacy in communicating conservation messages.

Environmental messages are delivered through symbolic language and culturally embedded narratives rich in moral meaning. In customary gatherings and everyday social interactions, the Parabela reinforces the value that protecting the sea is an integral part of the community's cultural identity. As one informant explained:

“When the Parabela speaks, it is not merely advice—it becomes an obligation that must be followed.”

Another informant added:

“Messages about protecting the sea are usually conveyed through traditional stories, not simply as prohibitions, but by explaining their meaning.”

These findings indicate that environmental communication in the context of *Kaombo* is not technocratic in nature, but rather grounded in cultural values and symbolic meanings. This supports perspectives in environmental communication studies suggesting that conservation messages are more effective when framed within culturally relevant contexts (Sowards et al., 2017).



Figure 4. Presents the Galampa, a traditional communal space where environmental communication, decision-making, and conflict resolution related to Kaombo are conducted.

Intergenerational Transmission and the Role of Informal Education

The sustainability of *Kaombo* practices is strongly influenced by the intergenerational transmission of values through informal mechanisms. Of the 11 informants, 8 reported that they were first introduced to *Kaombo* through family and social environments rather than formal education.

This learning process occurs through direct experience, such as participating in customary activities and observing how older generations adhere to *Kaombo* rules. As one informant stated:

“We learned about Kaombo from our parents, not from school. From an early age, we were taught what is allowed and not allowed in the sea.”

However, several informants also highlighted challenges in this transmission process, particularly among younger generations:

“Nowadays, children are less involved in customary activities, so their understanding of Kaombo is gradually declining.”

These findings suggest that informal education plays a crucial role in sustaining local ecological knowledge, yet remains vulnerable to socio-cultural change. This is consistent with the work of Raymond et al. (2010), which emphasizes the importance of intergenerational transmission of local ecological knowledge in supporting sustainable conservation practices.



Figure 5. Depicts the Pikama-maano Kampo tradition, a communal gathering that reinforces social cohesion and collective values underlying the *Kaombo* system.

Collective Compliance and Moral-Ecological Governance

Community compliance with *Kaombo* regulations reflects a form of environmental governance grounded in moral values and collective awareness. Of the 11 informants, 10 indicated that violations of *Kaombo* are rare, largely due to strong social control within the community.

Monitoring is not only carried out by traditional authorities but also collectively by community members. Violations are perceived not merely as individual misconduct but as breaches of social norms and cultural values. As one informant stated:



Figure 6. Shows a prohibition sign installed in the *Kaombo* area, representing the formalization of customary rules into visible environmental communication tools.

“If someone violates the rules, the community usually responds immediately. There is no need to wait for formal customary sanctions.”

Another informant added:

“The sense of shame is more severe than any formal sanction, because everyone knows when someone violates the rules.”

These findings suggest that the *Kaombo* system embodies a form of *moral-ecological governance*, in which social norms function as the primary

mechanism for regulating resource use. This is consistent with community-based management frameworks that emphasize the importance of collective participation and social norms in sustaining environmental governance (Pomeroy et al., 2018).

Reframing Kaombo: From Local Practice to an Environmental Communication System

Overall, the findings indicate that Kaombo can be reconceptualized as an integrated environmental communication system. All informants (11 out of 11) acknowledged that Kaombo not only regulates behavior but also shapes how the community understands and interacts with the marine environment.

Within this system, communication occurs not only through verbal expressions but also through symbols, rituals, and social practices that collectively construct environmental awareness. As one informant stated:

“Kaombo is not just a set of rules, but a way for us to maintain our relationship with the sea.”

These findings suggest that Kaombo holds significant potential to be developed as a culturally grounded model of environmental communication with broader global relevance. However, adaptation to ongoing social changes remains necessary to ensure the sustainability of this system in the future.

4. Discussion

Revisiting Community-Based Marine Conservation through Cultural Legitimacy

The findings of this study underscore that the effectiveness of the *Kaombo* system in marine conservation is not solely determined by its regulatory function, but more importantly by the cultural legitimacy embedded within the community. In contrast to conventional conservation approaches that are often policy-driven and top-down, *Kaombo* demonstrates that community compliance is more effectively achieved when it is grounded in shared social values and collective beliefs.

These results are consistent with the work of Berkes (2018), who emphasizes that the success of community-based resource management depends on the integration of local knowledge, cultural values, and social institutions. However, this study advances the discussion by showing that such legitimacy does not merely serve as an institutional foundation, but also operates as a communication mechanism that continuously shapes ecological behavior within the community.

By highlighting this dynamic, the present study extends the framework of community-based resource management by positioning communication not as a supplementary component, but as a central element in sustaining conservation practices.

Environmental Communication beyond Information Transfer: A Cultural-Symbolic Approach

In contrast to conventional environmental communication approaches that focus on information dissemination and knowledge-based behavior change, the findings of this study reveal that communication within the Kaombo system is symbolic, narrative-driven, and grounded in cultural values. Conservation messages are not delivered in technical terms; rather, they are conveyed through stories, rituals, and customary authorities that carry social and spiritual significance.

These findings reinforce arguments in environmental communication scholarship that the effectiveness of communication is largely determined by cultural context and the system of meanings held by a community (Sowards et al., 2017). However, this study offers a novel contribution by demonstrating that in indigenous communities, environmental communication is not merely a tool for message transmission, but an integral part of the social structure itself. In other words, environmental communication in the Kaombo context is embedded, where messages, media, and social practices are inseparable from one another.

Local Knowledge Transmission and the Challenge of Socio-Cultural Transformation

The findings indicate that the sustainability of the *Kaombo* system is highly dependent on the intergenerational transmission of knowledge, which occurs informally. This is consistent with the findings of Christopher M. Raymond et al. (2010), who emphasize the importance of local ecological knowledge in supporting environmental sustainability. However, this study also identifies a significant challenge, namely the declining involvement of younger generations due to social change and modernization. This condition reflects a gap between traditional value systems and contemporary social dynamics. If left unaddressed, it may weaken the effectiveness of the *Kaombo* system in the future.

Accordingly, this study highlights the importance of adaptive strategies to transform local knowledge transmission mechanisms so that they remain relevant, including through integration with formal education systems and modern communication media.

Moral-Ecological Governance as an Alternative to Formal Regulation

The findings further reveal that the sustainability of *Kaombo* is highly dependent on the intergenerational transmission of knowledge, which primarily occurs through informal mechanisms. This is consistent with Raymond et al. (2010), who emphasize the critical role of local ecological knowledge in supporting long-term environmental sustainability. However, this study also identifies significant challenges, particularly the declining engagement of younger generations as a result of socio-cultural transformations and modernization processes.

This trend indicates a growing gap between traditional value systems and contemporary social dynamics. If left unaddressed, such conditions may undermine the long-term effectiveness and continuity of the *Kaombo* system. Unlike previous studies that predominantly highlight the resilience of local knowledge systems, the present findings draw attention to their vulnerability in the face of rapid social change.

Therefore, this study highlights the need for adaptive strategies to sustain the transmission of local knowledge in ways that remain relevant to contemporary contexts. This may include integrating traditional ecological knowledge into formal education systems and leveraging modern communication media to enhance engagement, particularly among younger generations.

Reconceptualizing *Kaombo* as an Environmental Communication System

One of the central contributions of this study lies in the reconceptualization of *Kaombo* from a localized customary practice into a complex and integrated environmental communication system. Unlike previous studies that primarily position local wisdom as an instrument for resource management, this study demonstrates that *Kaombo* also functions as a communication mechanism that shapes community perceptions, values, and environmental behaviors.

This reconceptualization offers a new perspective in conservation studies by integrating cultural and communicative dimensions within a single analytical framework. In this sense, *Kaombo* can be understood as an alternative model for developing environmental communication strategies that are community-based, participatory, and context-sensitive.

Furthermore, these findings contribute to the global literature by proposing an approach that bridges three key elements—communication, culture, and conservation. This integrative perspective is particularly relevant in addressing contemporary environmental challenges, where locally grounded solutions are increasingly recognized for their potential to generate broader, scalable impacts.

5. Conclusion

This study demonstrates that *Kaombo* is not merely a form of local wisdom in marine resource management, but rather an integrated system embedded within the social, cultural, and communicative structures of the Wasuemba community. Using a qualitative approach, the findings reveal that the effectiveness of *Kaombo* in

supporting marine conservation lies in its ability to combine customary regulations, moral values, and culturally grounded communication mechanisms.

Environmental communication within the *Kaombo* system operates not simply as the transmission of information, but as a socially embedded practice expressed through cultural narratives, traditional authority, and everyday interactions. This process enables the collective internalization of conservation values, ultimately fostering sustained ecological compliance. In this context, the role of traditional leadership, particularly the Parabela, is crucial in maintaining both communication processes and the legitimacy of the system.

The study also highlights that the sustainability of *Kaombo* depends significantly on the intergenerational transmission of knowledge through informal mechanisms. However, ongoing processes of modernization and socio-cultural change pose substantial challenges, particularly in relation to the declining engagement of younger generations.

Conceptually, this research contributes by reconceptualizing *Kaombo* as a culturally embedded environmental communication system and by introducing the concept of *moral-ecological governance* as an alternative framework for community-based resource management. These contributions enrich the broader literature on environmental communication and community-based conservation, particularly within the context of indigenous and coastal communities in developing countries.

From a practical perspective, the findings underscore the importance of integrating local values and traditional communication mechanisms into conservation policy frameworks. Approaches that overlook cultural dimensions risk being ineffective in fostering community participation and compliance. Therefore, conservation strategies

should be designed in a context-sensitive manner by actively involving local actors and leveraging existing value systems.

Future research is recommended to explore the integration of traditional communication systems with modern communication technologies in order to strengthen the sustainability of local knowledge practices amid rapid social change. Additionally, comparative studies across regions are needed to assess the applicability and adaptability of the *Kaombo* model in diverse cultural contexts.

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7. Author Declaration

The authors have no conflicts of interest to declare.

References

- Ban, N. C., Mills, M., Tam, J., Hicks, C. C., Klain, S. C., Stoeckl, N., Bottrill, M. C., Levine, J., Pressey, R. L., Satterfield, T., & Chan, K. M. A. (2019). A social-ecological approach to conservation planning: Embedding social considerations. *Annual Review of Environment and Resources*, 44, 1–27.

<https://doi.org/10.1146/annurev-environ-101718-033028>

Berkes, F. (2018). *Sacred ecology* (4th ed.). Routledge. <https://doi.org/10.4324/9781315114644>

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>

Creswell, J. W. (2016). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage Publications.

Denzin, N. K. (1978). *The research act: A theoretical introduction to sociological methods*. McGraw-Hill.

Fikri, M., & Salim, A. (2022). Local wisdom in marine resource management in Indonesia. *Ocean & Coastal Management*, 223, 106145. <https://doi.org/10.1016/j.ocecoaman.2022.106145>

Geiger, N., Swim, J. K., Fraser, J., & Flinner, K. (2019). Catalyzing public engagement with climate change. *Global Environmental Change*, 55, 1–10. <https://doi.org/10.1016/j.gloenvcha.2019.01.003>

Halliday, W. D., et al. (2018). Indigenous knowledge and conservation. *Conservation Biology*, 32(5), 1231–1240. <https://doi.org/10.1111/cobi.13142>

Husain, N. M., et al. (2024). Local wisdom and marine conservation practices in Southeast Sulawesi. *Journal of Marine Studies*, 12(2), 45–60.

Keane, A., et al. (2020). The role of culture in conservation success. *Conservation Letters*, 13(5), e12738. <https://doi.org/10.1111/conl.12738>

Kvale, S. (2009). *Interviews: Learning the craft of qualitative research interviewing*. Sage Publications.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications.

Liu, J., Dietz, T., Carpenter, S. R., Alberti, M., Folke, C., Moran, E., Pell, A. N., Deadman, P., Kratz, T., Lubchenco, J., Ostrom, E., Ouyang, Z., Provencher, W., Redman, C. L., Schneider, S. H., & Taylor, W. W. (2023). Complexity of coupled human and natural systems. *Science*, 317(5844), 1513–1516.

<https://doi.org/10.1126/science.1144004>

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage Publications.

Moser, S. C. (2010). Communicating climate change: History, challenges, process and future directions. *WIREs Climate Change*, 1(1), 31–53. <https://doi.org/10.1002/wcc.011>

Pomeroy, R., Parks, J., & Balboa, C. (2018). Fisheries co-management: Key conditions and lessons learned. *Marine Policy*, 95, 1–8. <https://doi.org/10.1016/j.marpol.2018.05.019>

Raymond, C. M., Fazey, I., Reed, M. S., Stringer, L. C., Robinson, G. M., & Evely, A. C. (2010). Integrating local and scientific knowledge for environmental management. *Ecological Applications*, 20(7), 1763–1778.

<https://doi.org/10.1890/09-0847.1>

Sowards, S. K., et al. (2017). Environmental communication and social change. *Environmental Communication*, 11(3), 1–15. <https://doi.org/10.1080/17524032.2017.1308400>

Spradley, J. P. (1980). *Participant observation*. Holt, Rinehart and Winston.

Syahrtijan, S., et al. (2019). Traditional marine resource management in Indonesia. *IOP Conference Series: Earth and Environmental Science*, 343, 012123. <https://doi.org/10.1088/1755-1315/343/1/012123>

UNEP. (2019). *Marine pollution report*. United Nations Environment Programme. <https://www.unep.org>

Yin, R. (2017). *Case Study Research and Applications: Design and Methods*.